

Strategies for Dealing with Random Emission Standard Exceedances in Certifying Continuous Compliance

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ABSTRACT

Electric power plants subject to Title V permitting requirements must annually certify continuous compliance with the applicable opacity, SO₂ and NO_x emission standards among others. Under 40 CFR Part 75, all Affected Units have installed continuous emission monitoring systems (CEMs) to measure these emissions. With such continuous measurement, there is significant potential for emission rates to exceed the applicable standards. This means that many electric power plants are facing the prospect of certifying only Intermittent Compliance instead of Continuous Compliance in their annual Certification Statements required under the Title V permit.

State air pollution control agencies and the electric power industry have explored various approaches for dealing with this issue. Most of these have been unsuccessful due, in part, to U.S. EPA concluding that such approaches would involve backsliding leading to a potentially greater frequency of emission standard exceedances.

This paper discusses strategies for how to certify Continuous Compliance in the presence of random exceedances of the applicable standards.

The focus is on determining for each electric generation unit (EGU) a specific frequency of allowance exceedances that represents the actual historical operating practice of the EGU under proper operating conditions. We discuss how to use the substantial time series of CEM data each EGU has together with Monte Carlo simulation techniques to determine the minimum frequency of exceedance per quarter that needs to be allowed in the Title V permit so that Continuous Compliance can be certified.

Under the final Compliance Certification rule, such exceedances can occur and still allow certification of Continuous Compliance if these exceedances are specifically allowed in the source's Title V permit or allowed under state regulation. With these approaches, there would be no backsliding and a greater likelihood of approval by both state air pollution control agencies and U.S. EPA.

INTRODUCTION

Electric power companies must annually certify whether each of their emission units is in continuous or intermittent compliance with all applicable air pollution emission limits and other requirements of their Title V permits. ⁽¹⁾

With continuous emissions monitoring of opacity, sulfur dioxide and nitrogen oxides conducted by all EGUs of 25 megawatts or more as required under federal regulation ⁽²⁾, exceedances of these emission limits will sometimes occur especially in the case of the 6-minute opacity standards.

The purpose of this paper is to discuss strategies for certifying continuous compliance with emission limits for continuously monitored parameters given the random exceedances of these emission limits that sometimes occur.

The paper focuses on strategies for certifying continuous compliance with opacity standards. However, the ideas discussed herein are equally applicable to SO₂, NO_x, and other air pollutants for which there is continuous emissions monitoring.

U.S. EPA has issued guidance to state air pollution control agencies on identifying High Priority Violations (HPVs) that are candidates for enforcement actions ^{(3), (4), (5)}.

The HPV Policy applies to all major sources and synthetic minor sources as defined by the 1990 Clean Air Act Amendments that are in violation of a federally enforceable air pollution regulation where the applicable pollutant is one for which the source is categorized as major. The HPV Policy also applies to major sources violating the opacity standard.

Table 1 summarizes the updated conditions U.S. EPA has defined as identifying a HPV for CEM detected violations of non-opacity standards. ⁽⁵⁾ Table 2 summarizes the updated conditions U.S. EPA has defined as identifying a HPV for continuous opacity monitoring (COM) detected violations of the applicable opacity standard ⁽⁵⁾.

Tables 1 and 2 describes the type of violation, the method of detection, the emission standard averaging time being violated, the percent of operating time in excess of the applicable standard per reporting period, and the amount by which the emission standard is exceeded.

For example, in the case of continuous opacity monitoring in Table 2, a 6-minute opacity measurement more than 10% opacity in excess of a limit exceeding 20% would constitute an HPV if it occurred more than 5% of the operating time during the reporting period.

Table 1: U.S. EPA Policy on High Priority Violations (HPV) for CEM Detected Violations of Non-Opacity Standards

Violation	Method of Detection	Standard Averaging Time	% of Operating Time in Excess of Standard per Reporting Period	Amount in Excess of Standard
Violation of applicable non-opacity standard	CEM	≤ 24 hours averaging period	>3% to 5% for two consecutive reporting periods	AND >15% of applicable standard OR >SST
			>5%	AND >15% of applicable standard OR >SST
			>25% for two consecutive reporting periods	Any violation of the applicable standard
			>50%	Any violation of the applicable standard
		> 24 hours averaging period	Any	Any violation of the applicable standard

Notes: Supplemental Significant Threshold (SST) is defined as the following average exceedance of the applicable emission standard per reporting period:

CO 23 lbs/hr
 NOx 9 lbs/hr
 SO2 9 lbs/hr
 VOC 9 lbs/hr
 PM 6 lbs/hr
 PM10 3 lbs/hr

Table 2. U.S. EPA Policy on High Priority Violations (HPV) for Exceedances of Applicable Opacity Standards

Violation	Method of Detection	Standard Averaging Time	% of Operating Time in Excess of Standard per Reporting Period	Amount in Excess of Standard
Violation of applicable opacity standard	Continuous Opacity Monitoring (COMS)	0-20% opacity	>5%	>5% opacity
			>3% to 5% for two consecutive reporting periods	
		>20% opacity	>5%	>10% opacity
			>3% to 5% for two consecutive reporting periods	

Many states use “Discretionary Enforcement Authority” as their strategy for dealing with this issue, i.e. it is at the discretion of the state air pollution control agency enforcement authority on a case by case basis whether to designate one or more exceedances of the opacity standard as a violation and then use the above HPV Policy as a basis for discretionary enforcement action.

Another state strategy for dealing with this issue is to change state regulations and enforcement policies so that a certain number or percent of emission standard exceedances are allowed for each EGU statewide before a violation occurs.

North Carolina is the one state we know that has successfully changed its state regulation in this way with U.S. EPA approval.

North Carolina Rule 2D.0521 allows an EGU to have four exceedances of the 6-minute opacity standard of 40% per day as long as these exceedances do not exceed 0.8% of the total operating hours per year. Under North Carolina Rule 2D.535, startups, shutdowns and malfunctions may be excluded in determining the exceedance frequency.

Based on the prior North Carolina opacity rule in place, U.S.EPA determined that this new rule did not constitute backsliding and was approved.

Other states have had difficulty getting an alternative opacity regulation approved to address the opacity exceedance issue because U.S.EPA deemed it represented backsliding.

The focus of this paper is on a third strategy for addressing this issue. This strategy is to propose and have the state adopt for each EGU a Title V permit condition that allows exceedance of the opacity standard a certain percent of time each quarter.

The preamble to the amended EPA compliance certification regulation allows an electric power company Responsible Official to certify continuous compliance if the actual opacity exceedance percentage does not exceed an allowed opacity exceedance frequency in the Title V Permit.

Specifically, the preamble states with special emphasis on the portion in italics: “Absent evidence to the contrary, the responsible official for a source that is in compliance according to the monitoring results in the permit may certify “continuous” compliance, provided that the responsible official did not fail to monitor, or report, or collect the minimum data required by the permit; *if there were any deviations, these should have been excused by the permit.*”⁽⁶⁾

The balance of this paper discusses how to determine this allowable exceedance frequency to include in the Title V permit and an illustration of the results of such an analysis.

This analysis has been conducted for one electric power plant for the case of opacity standard exceedances. However, the results of that analysis may or may not be presented to the applicable state air pollution control agency.

PROCEDURES

The basic approach is to develop for inclusion in the Title V permit an allowed opacity exceedance frequency per reporting period (e.g. calendar quarter) for each EGU that represents the exceedance frequency occurring under best operating practices and proper equipment operating conditions that are consistent with past operation since continuous opacity monitoring began.

With this approach, there will be no “Backsliding” in terms of compliance with the opacity standards.

What statistical measure of the Allowed Opacity Exceedance Frequency per reporting period should be proposed in the Title V permit?

One approach is to use the average or median exceedance frequency per quarter in the Title V permit. The problem with this approach is that the EGU will violate the opacity standard about half of the of the calendar quarters leading to annual Compliance Certifications of Intermittent Compliance for most years.

A second approach is to select a “high” percentile of the exceedance frequency per quarter. For example, the allowed exceedance frequency in the Title V permit may be set at an exceedance frequency not exceeded more than 10% of all calendar quarters. The problem with this approach is that you still do not know whether the portion of future years you are able to certify Continuous Compliance is acceptable to your company.

To illustrate and assuming independence of exceedance frequencies from one quarter to the next, in the above case the probability of being in compliance in any one calendar quarter is 1-the probability of being out of compliance or $(1-0.1) \times 100\% = 90\%$. As a result, the probability of certifying Continuous Compliance in any year is only $(1-0.1)^4 \times 100\% = 66\%$ and the probability of certifying Continuous Compliance for ten consecutive years is only $(0.66)^{10} = 2\%$.

A third approach and our recommended approach for determining the percentile of the frequency distribution of allowance exceedances per quarter to include in the Title V permit to allow certifying Continuous Compliance for the large majority of future years is to apply Monte Carlo simulation to the time series of the number of opacity exceedances per quarter for five or more years.

The results of the simulation will be the fraction of future years in which the EGU will have to certify Intermittent Compliance because there were one or more calendar quarters in the year when the simulated opacity standard exceedance frequency was greater than the acceptable exceedance frequency per quarter being evaluated for inclusion in the Title V permit.

As an alternative, the results of the simulation could be the fraction of future 10-year periods in which the EGU had to certify Intermittent Compliance in one or more of those 10 years.

This work involves the following steps:

- 1) determining the fraction of time the opacity standard for the EGU is exceeded in each calendar quarter for each quarter with COMs data,
- 2) developing a cumulative frequency distribution of this fraction of time, i.e. percent of time that the frequency of exceeding the opacity standard each quarter is less than or equal to each value,
- 3) running a Monte Carlo simulation to determine the probability of certifying continuous compliance with the opacity standard for every year of a ten-year period based on allowing various percent exceedances of the standard per quarter,
- 4) making a management decision on what probability of certifying continuous compliance with the opacity standard in *every year over a ten-year period* is acceptable, and
- 5) selecting as the Allowed Opacity Exceedance Frequency per reporting period to include in the Title V permit the one determined in the Monte Carlo simulation that corresponds to the acceptable probability of Compliance Certification from Step 4.

CONCLUSIONS

U.S. EPA's amended Compliance Certification regulation offers the opportunity for EGUs and other sources to certify Continuous Compliance with all applicable requirements in the Title V permit in the presence of random emission standard exceedances resulting from continuous emissions or opacity monitoring.

The key to doing this is to develop for inclusion in the Title V permit an allowed exceedance frequency per reporting period (e.g. calendar quarter) for each source. This exceedance frequency be the one occurring under best operating practices and proper equipment operating conditions that are consistent with past operation since continuous monitoring began. This allowed exceedance frequency for inclusion in the Title V permit can be developed using source specific emissions or opacity monitoring data and Monte Carlo simulation methods.

With this approach, there will be no "Backsliding" in terms of compliance with the applicable emissions or opacity standards. This should increase its prospects for acceptance by U.S.EPA and state air pollution control agencies. However, we are unaware of any source that has yet applied to use this new approach.

REFERENCES

- (1) 40 CFR Parts 70 and 71, State and Federal Operating permits Programs
- (2) 40 CFR Part 75, Continuous Emission Monitoring

(3) U.S. EPA, Issuance of Policy on Timely and Appropriate Enforcement Response to High Priority Violations, Eric Schaeffer, Director Office of Regulatory Enforcement, December 22, 1998

(4) U.S. EPA, Workbook. The Timely and Appropriate (T&A) Enforcement Response to High Priority Violations (HPVs), Office of Enforcement and Compliance Assurance, Air Enforcement Division, June 23, 1999

(5) U.S. EPA, The Timely and Appropriate (T&A) Enforcement Response to High Priority Violations (HPVs), Policy Presentation , Region III, Air Protection Division, Office of Enforcement & Permits Review, Winter/Spring 2004, Philadelphia, PA

(6) U.S. EPA, “State and Federal Operating Permits Program: Amendments to Compliance Certification Requirements, Final Rule”, Federal Register, Vol. 68, No. 124, June 27, 2003, Page 38520